

SFD-100[™]

Ultrasonic Systems Flaw Detector







Moulded to your specification



Flexible

The SFD-100 range of ultrasonic instrumentation can be moulded to your inspection requirements, capable of producing A-scan, B-scan, C-scan and strip chart information. It uses NDT Solutions' bespoke powerful data capture and high performance multi-channel pulser-receiver hardware for mixed pulse-echo, through-transmission inspections.

The user interface can be designed by our systems integrators to contain as much or as little information as your operators desire. Custom workspace's can be created in partnership with you to suit your workflow requirements. Controls and displays can be grouped together on pages of your design offering complete flexibility to meet the needs of a wide variety of inspections.

If your intention is to use the instrument for several different inspections, the SFD-100 software allows a workspace to be created for each application, tailored to your needs.

Utilising InspectionWare, produced by Utex Scientific, our innovative instrument can directly drive a wide range of motion control hardware making it ideally suited for upgrading existing scanning equipment as well as for commissioning new systems.

SFD-100 is available in two packages: a small compact lunchbox PC that can easily be transported around site; and an industrial rack-mount instrument for control and monitoring within a production plant. The latter can be highly customised to suit existing control gear, sensors and probes that you already own; the perfect solution for refits, upgrades, and new installations.

1 A large palette of acquisition, inspection, data storage and DSP tools can be added to your workspace to create an interface that meets your inspection requirements.



2 Pages and controls can be designed to your specification, with the controls that your operators need, and clear results displayed in the format that you want them. Report templates can be generated showing only the data and information you require in the layout that you specify.



The end result is an interface moulded to your specification, with the functionality you need, presented in a way that is efficient and clear for your operators. We can even create a different interface for the different products you test.





Seamless

Key to the integration of any ultrasonic inspection instrument is the range of interfaces available for connection with control and measurement equipment such as PLCs, proximity sensors, encoders, temperature sensors etc. The SFD-100 encompasses a range of digital and analogue input/output ports, 6 simultaneous encoder inputs, high current switched outputs and a 4-20mA current loop output.

The SFD-100 is more than just a measurement instrument; combining ultrasonic testing with automation it can control your inspection facility. With powerful motor control capabilities your scanning system can be integral to your custom workspace.

For the standardised testing of parts, scans can be started with the press of a button, inspection results viewed and printed, and report generation can be automated. Documents and inspection results can be saved to your network drives and printers. As you would expect, you can design your reports specifically to your needs and include as little or as much information as you require.

Your inspection software can be presented in all European and most world languages.

Fast

Our dedicated data capture hardware ensures the very best scanning performance, capable of the highest ultrasonic repetition rates. Data can be captured in free running mode or synchronised to encoder position, ensuring only the information you want is recorded.

All A-scan gating and rectification is performed digitally in dedicated FPGA (Field Programmable Gate Array) hardware allowing fast multichannel C-scan and strip-chart capture.

Data is automatically selected to provide the operator with maximum peak echoes (or minimum peak for back-wall) to ensure defects are never missed due to the high speed repetition rates.

Parts Canton Processing Parts Canton Processing Proc

Data is digitised with amplitude resolution of 12 bits, sampled at rates of up to 100MHz with over-sampling up to 400MHz available. Our multiplexed systems are capable of operating at a PRF (Pulse Repetition Frequency) of up to 100kHz. This extraordinary pulsing rate enables your parts to be inspected using the SFD-100 at higher speeds and with greater resolution whilst ensuring reliable defect detection at all times.

Powerful

The SFD-100 instrument features 400V pulsers and sensitive receive amplifiers with selective filters for the optimum defect detection. The instrument is available with 1,2, 4, 8 or 16 channels.

Unlike many multiplexed ultrasound systems, the SFD-100 offers truly independent configurations per cycle. All A-scan, TCG (Time Corrected Gain) and gate parameters can be entirely separate for each cycle, allowing for a wide range of different transducers and inspection types to be performed simultaneously using the single instrument.

The SFD-100 has up to 6 measurement gates, with interface triggered TCG having its own dedicated gate. Gates can be used for defect detection as well as being used to make measurements from the A-scan data.

Powerful DSP (Digital Signal Processing) engines in the hardware and software allow complex calculations, decision trees and hierarchies to be constructed so that alarms, actuators, motors etc. can all be controlled based on real-time inspection results.

The modular design of the hardware allows for additional channels and functionality to be added, suited to your individual requirements.





Tough

All of NDT Solution's products are designed with the highest quality electronics, and the SFD-100 is no exception.

Designed to fit standard industrial rack systems, your SFD-100 can be commissioned with power filtering, protection and with battery backup for brown-outs or power cuts. Air conditioning and filtration units can be fitted to rack enclosures for operation in extreme climates or dusty environments.

Our novel noise filtering algorithms protect the instrument from electrical machine noise, preventing false gate triggers. Coupled with our maximum echo algorithm, we ensure excellent defect detection and the best possible rejection of unwanted noise.

The SFD-100 encoder inputs are all auto-sensing differential as standard, providing the best quality position data.

The SFD-100 instrument is the complete, robust instrument, designed to meet the most demanding of testing requirements.

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Power Supply:	Universal power supply (110-240V)
Dimensions:	Lunchbox - 400 x 290 x 224mm (W x D x H)
	Rack-mount processor unit - 482 x 510 x 177mm
Weight:	Lunchbox - 12Kg
	Rack-mount processor unit - 15kg

Applic on Software

A, B, C-scan and strip chart A-scan envelope: Hilbert transform enveloping Maximum peak A-scan displayed at very high pulser repetition rates Customised user interface Extensive DSP toolbox including FFT analysis Waveform processors: Re-sampling, 2D and 3D data processors. Evaluation tools: Polygon, Circle, Ellipse, Rectangle, Linear and Area measurements with statistics. Colour palette editing: Fully user definable colour maps Motion control Multi language support Gating: Hardware and software gates for triggering alarms and/or recording measurements Filtering: Averaging and FIR filters Noise glitch suppression: Electrical noise spikes from heavy machinery. No. of cycles in acquisition sequence: 32 Modes of operation: pulse-echo and through transmission selectable per cycle Sequenced Parameters: all gates and A-scan parameters per cycle Electronic Specification **Receiver Inputs** Number of channels: 1, 2, 4, 8, 16 Switched input impedance: 50/100/ 200/500R per channel Input attenuator: 0/-20/-40 dB Input preamp: +20dB low noise preamp Receiver gain: 90 dB System Bandwidth: 0.1 to 25MHz (-6db) Bandpass filters: 0.5/1/2.5/5/10/15MHz TCG: No. of points: 16 Amplitude resolution: 0.3dB Time resolution: 10ns Total correction: 80dB Slope range: 0 - 40dB/µs Dynamic range: >80dB Channel crosstalk isolation: >80dB Same channel isolation: >80dB Near surface resolution: 1.5mm for 1/64th FBH in steel. Receiver noise: 1.3nV/Sqrt(Hz) to 2nV/Sqrt(Hz) depending on filtering Connections: LEMO or BNC patch bays Pulser Outputs Output Voltage: -20V to -400V negative square wave Rise and Fall times: 5ns ± 1ns Pulse width: 10ns to 2us in 10ns steps Output protection: Fully short circuit output protected Max Repetition rate: @10ns PW - 100KHz / number of cycles used @50ns PW - 20KHz / number of cycles used Hardware Processing Gates: 6 gates + 1 interface gate Gate modes: C-scan / Strip Chart Peaks per gate: 1st, 2nd, ...10th, maximum, last Gate triggering: peak, leading/trailing flank, zero crossing Measurement types: Relative or absolute in any combination Rectification: RF, FW, HWP, HWN Over sampling: up to 400MHz DAC gates: Available on request Backwall Attenuator gates: Available on request Automation Motor control: servo or stepper up to 6 axis Encoders: 6 channel single ended/differential Input / Output External Trigger Input: 3.3V pulse input (5V tolerant) Sync output: 3.3V pulse output High current switches: 4 Channels, 500mA, 30V max rating. PC Interfaces: USB, RS232, Parallel, SVGA, PS2

Option 1: SAP, T-SYNC: TTL compatible outputs High current digital outputs: 16 outputs for connection to TTL/PLC etc. Analogue outputs: 16 outputs (0-5V range) Option 2: Analogue Inputs: 8 Channels (± 2.5V Range) Analogue Outputs: 8 Channels (0-5V Range)

> Current loop output: 4 to 20mA output Digital I/O: 12 lines of Bi-Directional 3.3V (5V tolerant)

Application Areas







C-Scan Inspection

Bar/Tube Quality Control

Forging Quality Control

Billet Quality Control

Weld Quality Control

Rail Manufacture Quality Control



Casting Quality Control

Multi-Channel Thickness Mapping

Ultrasonic Probes

NDT Solutions offer an extensive range of transducers tailored to the individual requirements of your application. From standard to ultra-high resolution, bespoke probes we can provide you with the ideal solution to meet the inspection demands. Transducers can be manufactured in a number of styles including immersion, contact or for use within scanning bubblers. All transducers are manufactured to exacting standards for acoustic, electronic and mechanical properties, supplied with complete test certification.



SFD-100^{**}

- 4 1 5 2 3 1 Rack Enclosure for SFD instrument, alarms, display and printer 2 Ultrasonic probes 3 Distance encoders, proximity sensors etc. 4 Existing industrial plant controller
 - 5 Interfacing between plant controller and SFD instrument



Example

The schematic shown above illustrates a typical pipe testing system. Existing plant electronics control the testing line, which is equipped with position encoders and proximity sensors to monitor the position of the product being tested.

NDT Solutions provide an additional cabinet, housing everything required to perform the ultrasonic inspection, including a large display, industrial alarm system, power protection, printer, and of course the SFD instrument itself.



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The Portable SFDL-100

The SFDL-100 is a portable instrument offering a multi-channel systems' flaw detector in a lightweight package. The SFDL-100 uses the same high quality ultrasonic and data capture electronics as the SFD-100 with up to 8 fully independent channels. Choose from a range of preconfigured workspaces for common applications, or we can design a custom workspace for your requirements. The SFDL-100 can also interface to a wide range of hardware, offering digital and analogue inputs and outputs.



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The SFD-100 is the complete, versatile, multiple channel ultrasonic instrument. The electronic hardware can be specified to meet your inspection requirements incorporating displays, alarms and interfacing to your scanning equipment. For automated inspections, the instrument is supplied as a robust 19" rack with air filtering and temperature control as necessary. The performance of the ultrasonic hardware is delivered to the user through a customised workspace to provide the exact interface that you want. The examples below show just a small selection of what is possible with the SFD-100. For automated applications, reports can be automatically generated, and batch reports may be created and printed summarizing the key information you need for your inspection.



A-Scan Display

The SFD-100 displays a large A-Scan for any selected cycle in the inspection. The parameters you wish to include can be displayed in most world languages providing a clear interface for your operators. We can also provide controls to set up your scan with encoder position readouts, with operator details, part information and any other information you need to include in your evaluation.



Multi A-Scan Display

For multiple channel applications, the ability to see and compare A-Scans from several cycles in the inspection is important. In this example six A-Scans are shown however for more complex inspections a larger number may be included. As can be seen, each A-Scan has its own gain control on this particular set up. It is your choice which controls and information are displayed on each page, configured to suit your needs.



Alarms and Gates

The SFD-100 has a powerful set of gates which may be applied completely independently on each cycle. A-Scan gates operate in dedicated FPGA hardware for optimum performance, and software gates are also available that can be applied to A-Scan and strip chart plots. Gates can be used to drive analogue outputs and trigger alarms which are clearly displayed in software to your specification, and may connect to external alarm units as required. Alarms and analogue outputs can be set from calculations of any gate output in any cycle of the inspection, allowing complex decision making functionality.

Strip Chart Displays

Strip charts showing the measurements from several cycles can be displayed live during the inspection, containing amplitude, time of flight data, or a mixture of each. As many strip charts can be included as your inspection demands and additional gates can be created on the strip chart itself for triggering alarms and to control plant mechanics. The SFD-100 is not limited to strip charts, it can produce C-Scan and B-Scan displays too with powerful evaluation tools and colour map controls.

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